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ABSTRACT

Many teaching methods investigated in higher education have been examined by social work educators, except for mastery learning. Mastery learning is a behavioral teaching method used successfully in higher education. Achievement is held constant and time allowed is varied, rather than holding time constant and allowing student achievement to vary. Thus, mastery learning uses time flexibility to increase student learning and performance. This study examines how mastery learning performed in an undergraduate social work (BSW) course compared to non-mastery learning instruction. The major research question investigated was, "Do mastery learning and non-mastery instruction have different effects on social work students' academic achievement, attitude toward course topic, and preference for instructional method?" Cites 46 resources. (Author/BB)

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A Contrast of Mastery Learning and Non-Mastery Learning Instruction in an Undergraduate Social Work Course

A paper presented at the 1998
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INTRODUCTION

It can be confusing for new social work educators to decide on which teaching method to employ in their classrooms. Novice social work instructors expecting to use "traditional instruction" will find the term poorly operationalized (Guskey, 1988; Swanson, 1977). Novice social work educators can review the literature in social work education and educational psychology for ideas on what teaching methods to employ. Reviewing the encyclopedic Handbook of Research on Teaching reveals that many teaching methods investigated in higher education also have been investigated by social work educators, except for the teaching method called mastery learning (McKeachie, 1963; Dunkin & Barnes, 1986; Trent & Cohen, 1973). Mastery learning is a behavioral teaching method used successfully in higher education (Guskey & Pigott, 1988; Kulik, Kulik & Bangert-Drowns, 1990).

PURPOSE

This study examined how mastery learning performed in an undergraduate social work (BSW) course compared to non-mastery learning instruction. The major research question investigated was: Do mastery learning and non-mastery instruction have different effects on social work students' academic achievement, attitude toward course topic, and preference for instructional method? Also investigated were (a) student course evaluations and (b) instructor hours spent.

Literature Review

Mastery learning is the group-based implementation of the Carroll model of school learning. The Carroll model suggests learning is dependent on the amount of:

time needed to learn and time allowed to learn (Carroll, 1963). Learning should increase as time allowed increases. In other words, achievement is held constant and time allowed is varied, instead of holding time constant (e.g., one semester) and allowing student achievement to vary (Bloom, 1968, 1984; Carroll, 1963). Mastery learning involves using time flexibly to increase student learning and performance. For example, students are often given time to retake parallel versions of exams or rewrite projects until reaching mastery. The additional time allows students to clarify poorly understood material before retesting.

Distinguishing features of mastery learning include (a) curriculum alignment, (b) formative evaluations, (c) feedback and correctives, (d) retesting cycles, and (e) criterion referenced grading (Anderson, 1993; Bloom, 1968, 1984; Guskey, 1987; Kulik, Kulik & Bangert-Drowns, 1990). Vertical and horizontal curriculum alignment involves the similarity of course content taught and tested (Guskey, 1985; Cohen & Hyman, 1991). Horizontal curriculum alignment refers to the linear progression of course material from lesson planning through teaching and testing. Material is horizontally aligned when it is both taught and tested. This prevents testing material that is not taught and spending instructional time on material that will not be tested. Vertical curriculum alignment refers to the hierarchical nature of Bloom's (1956) taxonomy of six educational objectives (knowledge, comprehension, application, analysis, synthesis, and evaluation). Vertical curriculum alignment means course material is taught and tested according to the same knowledge level because understanding course content at lower levels does not guarantee understanding at higher levels. For example, instruction should support

whether an exam requires students to recognize the name "Mary Richmond" (knowledge) or critique her contribution to social work (evaluation).

Formative evaluations measure the "formation" of knowledge and commonly take the form of short ungraded quizzes. Formative evaluations will be referred to in this study simply as quizzes. Quizzes are intended to monitor learning progress and, therefore, often do not count toward final grades (Bloom, Hastings & Madaus, 1971). Additionally, quizzes are "self-scored" immediately so students see which questions they answered correctly or incorrectly. This helps the students and instructor to identify and correct learning errors. Summative evaluations measure the "summation" of learning and normally take the form of graded exams (objective or other format). Feedback refers to instructors' providing information on student learning progress. Commonly instructors give students the answer keys to quizzes and exams so they can "see" what was answered correctly or not.

Correctives refer to correcting student learning errors by re-teaching material, providing remedial material, or using other methods. Re-testing cycles usually refers to taking parallel forms of exams. The parallel forms are commonly called make-up exams and often have the same number and type of questions as on an exam but phrased differently and with different response choices. In mastery learning, "make-up exams" are often open to all students who voluntarily wish to retake an exam to improve their grades and are not something students take when they failed to attend or "missed" an exam. Ideally, make-up exams should be as difficult, or more difficult, so any increased achievement is less likely the product of "easier" tests. Students commonly check the

answer key after an exam to identify which questions were answered incorrectly so that they can restudy poorly understood material and then take a make-up exam that tests the same material. Mastery learning uses criterion-referenced instead of norm referenced measurement to grade student performance (Bloom, Hastings & Madaus, 1971). Criterion referenced measurement compares performance to a standard, whereas, norm-referenced measurement (the normal curve) compares performance of other students. Criterion referenced measurement may produce score distributions the deviate from a normal curve because it is possible for all students to meet the criterion (Gronlund, 1981; Martuza, 1977).

What does the research reveal about the effectiveness of mastery learning on achievement? Mastery learning has generated enough research to merit two syntheses of research that include 31 college level studies in the social sciences, hard sciences, health sciences, and languages, but not social work (Guskey & Pigott, 1988; Kulik, Kulik & Bangert-Drowns, 1990). Twenty-nine of the 31 college level studies had positive effect sizes that ranged from a low of -.37 (little effect on academic achievement) to a high of +1.69 (large effect on academic achievement) with an average effect size of +.50 (mild positive effect). Students had mainly positive reactions to mastery learning and made positive changes regarding attitudes toward course topic (Bauman, 1980; Brown, 1977; Goldwater & Acker, 1975; Guskey & Pigott, 1988; Kulik, Kulik & Bangert-Drowns, 1990; Whiting & Render, 1984). Mastery learning had positive results in higher education, but would this be the case in social work education?

Sample

The site for this study was a public, Northeastern, urban, commuter/resident college in the USA that enrolled approximately 12,000 students. The Social Work Department had 275 students and nine full-time faculty. A convenience-sampling plan generated 137 students registered in four sections of a junior-level introductory social work course that addressed poverty, the poor, anti-poverty strategies, and attitudes toward poverty. Lack of random assignment negates internal validity but may strengthen ecological validity because this study occurred in an actual college classroom under normal conditions (Gentile, 1990). To decrease registration based on instructor preference or reputation, all course sections listed the instructor as "STAFF."

The four course sections were collapsed into two groups; mastery and non-mastery. Independent t-tests showed both groups had similar distributions of (a) age (Mean= 24 years; range: 18-45 yrs), (b) entry grade point average (Mean= 2.9 of 4.0), and (c) entry knowledge levels (37.7% of 100% on a knowledge pretest). A Chi-square showed both groups had similar distributions of (a) gender (Female: 77%, Male: 23%), (b) race, (White: 82%, Black: 11%, Hispanic: 4%, Asian: 2%, other: 1%) and (c) academic major (SW: 28%, Non-SW: 72%). As expected for an introductory level course, most students were non-social work majors. The sample was primarily white, female, with a mean age of 24 years.

Similarities between the course sections included course content, outlines, readings, texts, exams, enrollment, and meeting days. The mastery instructor was a Hispanic male with seven years of teaching experience, all with mastery learning. The

non-mastery instructor was a white female with 21 years of teaching experience, none with mastery learning.

Independent Variable

The independent variable was the instructional method. Mastery learning was implemented in this study using (a) curriculum alignment, (b) three written study guides distributed to students, (c) six ungraded quizzes, (d) three graded exams, (e) one make-up exam for each exam, and (f) instructor-led feedback and correctives, both in-class and outside class. Non-mastery instruction most resembled a combination of the lecture and discussion methods. Both instructional methods used the same exams and criterion-referenced grading.

Design

A quasi-experimental, repeated measures design using college classes as intact groups, was employed (Campbell & Stanley, 1963). Mastery and non-mastery instruction were contrasted, using four sections of the same 16-week, undergraduate social work course. It is always possible that any differences in results found between two groups were the result of threats to internal validity or factors other than instructional method. The threats of history and maturation were controlled in this study because both groups were equivalent and were studied at the same time (Campbell & Stanley, 1963). To decrease the threat of instrumentation, the mastery instructor explained, distributed, and collected from both groups the consent forms, knowledge pre-test, measures of instructional preference, and attitudes toward course topic.

The threat of testing could not be controlled in this study because the mastery group had nine more testing opportunities than the non-mastery group, in the form of six quizzes and three make-up exams (as shown in table one). However, frequent testing is a main effect of mastery learning and equalizing the testing between the groups would have made non-mastery instruction more like mastery learning, thus weakening the contrast.

Table 1 Instrument Summary: Groups and Times Administered

Administered	Instrument	Groups
Pre-Instruction	Demographic survey	Both
	Entry knowledge level	Both
Post-Instruction	Instructional preference	Both
	Retention test	Both
	Mastery attitude survey:	
	Quantitative	Mastery Only
	Qualitative	Mastery Only
Pre, Post Instruction	Attitudes toward:	
	the poor	Both
	poverty	Both
	public assistance	Both
	socio-political concerns	Both
Three times During instruction	Three Exams	Both
	Three Make-up exams	Mastery Only
Six times During instruction	Six ungraded quizzes	Mastery Only

Dependent Variables

Several dependent variables were employed to generate a fuller picture of mastery learning for social work education. Academic achievement and retention of achievement were included because achievement is the "hard currency" of education and retention of achievement over time is a goal of all education. Achievement is

defined as performance on academic testing expressed as the percent of questions answered correctly of 100%. Retention is defined as the recall, after 12 weeks, of material from exam one that was retested on exam three.

Student attitude toward mastery learning also was measured. If students disliked the teaching method, their dislike may have generalized to the course topic. To examine if this occurred, student attitudes toward the poor and several aspects of poverty were measured. Student course evaluations were included to examine if students responded negatively to the instructor teaching with mastery learning. Finally, instructor hours spent during the semester were included as a crude indicator of labor intensiveness.

Measures

All measures were instructor-created, except for the standard social work department course evaluation form and the measures of attitude toward the poor (Grimm & Orten, 1973; Howard & Flaitz, 1982; Moran, 1989; Rosenthal, 1993; Sharwell, 1974). The validity of the instructor-created instruments was checked with the "recognized experts'" method, the doctoral committee guiding this research. The committee examined and modified the instruments to increase content and face validity.

To increase exam reliability, all exams used the multiple choice, objective format (Green, 1970; Gronlund, 1981; Martuza, 1977; Roid, 1982). A table of specifications was created to focus instruction and testing on essential content and to prevent testing material not taught (or the reverse) (Gentile, 1990; Harris, 1974). The non-mastery instructor verified that the exams and make-up exams covered her course content although she did not utilize make-up exams.

It was crucial to insure the exams and make-up exams were equivalent since they would be used to generate data on academic achievement and because a student's make-up exam score would replace their exam score. Any achievement gains would be suspect if make-up exam were easier than the original exams. To test if the 50 item exams and 50 item make-up exams were equivalent, they were piloted by combining them into three, 100 item exams (exam 1 + make-up exam 1; exam 2 + make-up exam 2, exam 3 + make-up exam 3). The difficulty index of each exam and matching make-up exam was within .1, suggesting they were equally difficult.

Other academic achievement measures included (a) six 13-item quizzes, (b) one 12-item knowledge pre-test, and (c) one 26-item retention test. The knowledge pre-test included four questions taken from each exam, each had a difficulty index of at least .6 in the pilot test. The retention test included 26 questions taken from exam one with a difficulty index of .3 or higher. To decrease chances students would restudy material from exam one, they were not told exam three had 26 extra questions taken from exam one that would not count toward the exam three grade.

As shown in table two, four instruments previously used with social work students measured student attitudes toward (a) the poor, (b) public assistance, (c) poverty, and (d) socio-political concerns (Grimm & Orten, 1973; Howard & Flaitz, 1982; Moran, 1989; Orten, 1979; Rosenthal, 1993; Sharwell, 1974). The original articles describe the validation of the instruments. Pilot testing in the host course revealed the instruments had adequate reliability and stability.

Table 2 Measures of Attitudes Toward Course Topic

Name of Measure	Source	Items	Measures attitude toward
Peterson's Poor Scale	Peterson, 1967	40	The poor
Attitude toward public assistance scale	Anderson, 1965, 1966	16	Public assistance
Attitude toward poverty scale	Rosenthal, 1993	21	Causes of poverty; internal, structural, antipathy
Social Humanistic Ideology Scale	Howard & Flaitz, 1982	20	Socio-political concerns, Subscales: social justice, human nature

Peterson's Poor Scale (Peterson, 1967) measures whether attitudes toward the poor are favorable or unfavorable. The Social Humanistic Ideology Scale (Howard & Flaitz, 1982) has subscales measuring agreement/disagreement with statements related to social justice and human nature. The attitude toward poverty scale has subscales measuring antipathy toward the poor and the belief poverty results from internal or external causes (Rosenthal, 1993). The attitude toward public assistance scale measures agreement/disagreement with statements about public assistance (Anderson, 1965, 1966).

Preference for instructional method was measured with one instructor-created, fixed-response question: Would you prefer mastery or non-mastery instruction if the semester were beginning again? Standard social work department course evaluations collected data regarding the instructor and the course. The course evaluation had 16 positively phrased questions with a five-point Likert scale and response choices from strongly agree to strongly disagree. An instructor-created weekly calendar collected

self-reported data from both instructors about the number of hours spent with students outside class time.

RESULTS

Quantitative data were analyzed using SPSS and alpha levels of .05.

Achievement

It was simplest to examine the achievement data with a repeated measures MANOVA (Multiple Analysis of Variance) since the contrast involved two teaching methods (mastery, non-mastery) and three achievement tests (exam 1-3). The MANOVA was done twice on the achievement data because a student's make-up exam score replaced his/her original exam score in the mastery group. Doing the MANOVA twice would show how the mastery group performed before and after taking the make-up exams.

Table 3 Mean Exam Scores before Make-up Exams

	Mastery		Non-Mastery		Difference
	M	SD	M	SD	
Exam 1	81.12	10.44	82.10	11.50	0.98
Exam 2	84.44	10.01	83.90	10.80	0.54
Exam 3	75.09	10.85	79.00	11.70	3.91

The first MANOVA detected an interaction effect between instructional method and tests ($F(2,399)=4.19$, $p<.05$) (Glass & Stanley, 1970; Lubin, 1961). The interaction effect detected is called a disordinal or "crossed interaction" because the lines representing treatment effects "cross each other" when graphed. A crossed interaction

makes it difficult to say if one group did better than another because the groups take turns outscoring each other. The mastery group had greater mean scores than the non-mastery group on exam two but not exams one or three (table three).

Seventy-nine make-up exams were taken in the mastery group and a make-up exam score replaced a student's original exam score. Exam score gains were examined by paring a student's make-up exam score with what he/she scored on the exam. Table four includes mean exam and make-up exam scores only for students who took make-up exams. Paired t-tests showed significant make-up exam score gains over original exam scores and an average gain of 12.67 points.

Table 4 Mean Make-up Exam Scores and Corresponding Exam Scores

	Make-up Exams Taken		Original Exam Score	Make-up Exam Score	Change
Exam 1	29	M	74.70	90.80	+16.10**
		SD	10.00	7.30	
Exam 2	22	M	77.10	82.10	+5.00*
		SD	9.90	5.50	
Exam 3	27	M	66.00	83.00	+17.00**
		SD	8.90	8.70	
Total	N = 79				

Note. *p<.01 **p<.0001

Table 5 Mean Exam Scores after Make-up Exam Score Replacement

	Mastery		Non-Mastery		Difference
	M	SD	M	SD	
Exam 1	88.00	7.90	82.10	11.50	5.90*
Exam 2	86.40	7.90	83.90	10.80	2.50
Exam 3	81.70	7.80	79.00	11.70	2.70

Note. * $p<.05$

After the 79 make-up exam scores replaced the original 79 exam scores in the mastery group, the second repeated measures MANOVA detected an "ordinal" interaction effect between instructional method and tests ($F(2,399)=3.20$, $p<.05$). An ordinal interaction means one group outscores another group but not to the same degree (Glass & Stanley, 1970; Lubin, 1961). The lines representing treatment effects are not parallel when graphed, but do not cross each other, meaning one group outscored the other. As included in table five, the mastery group outscored the non-mastery group on all three exams, but the difference ranged from a low of 2.5 to a high of 5.9 points. The second MANOVA revealed that the instruction variable was significant ($F(1,399)=6.49$, $p<.05$) indicating a difference between the mastery and non-mastery groups on achievement. Independent t-tests showed the 5.9 point difference between the exam one scores accounted for the difference on achievement between the groups ($t_{(132)}=-3.47$, $p=.001$, two-tailed).

In summary, the mastery group outscored the non-mastery group when make-up scores were considered (effect size = +.33) and both groups achieved similar results when make-up exam scores were not considered (effect size = -.12). The mean gain of

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12.67 points on the make-up exams (the equivalent of more than one full grade level) raised the mean achievement scores of the whole mastery group.

Retention

Twenty-six test items included on exam one were included again on exam three to test retention. The scores the 26 items generated on exam three were subtracted from the scores they generated on exam one (Table 6). Having the same score twice (no difference) suggests high retention from exam one to exam three. The maximum score was 26.

Table 6 Mean Retention Scores: Exam One and Retention Test

	Mastery		Non-Mastery		Difference
	M	SD	M	SD	
Exam 1R[a]	18.85	3.59	19.39	3.93	0.54
Retention[b]	13.29	2.77	12.73	4.15	0.56
Difference	5.56	3.04	6.75	3.48	1.19*

Note. *$p<.05$, two-tailed. Max score possible = 26.00

a: 1R = scores the 26 items generated on exam one.

b: Retention = scores the same 26 items generated on exam three.

Independent t-tests showed both groups had similar scores for the 26 retention items on exam one ($t_{(131)}=.83$, $p=.40$, two-tailed), and similar scores for the same 26 items on exam three ($t_{(131)}=-.93$, $p=.36$, two-tailed). However, the mastery group had a smaller difference score than the non-mastery group suggesting greater retention over the 12-week interval from exam one to exam three ($t_{(131)}=2.11$, $p=.04$, two-tailed).

Attitudes Toward Course Topic

A MANOVA also was used to examine student attitudes toward the course topic, because there were seven attitude measures. The MANOVA showed no interaction

effects and no differences between the mastery and non-mastery groups. However, the MANOVA showed that changes in attitude toward course topic did occur in both groups from pre- to post-testing ($F(7,123)=9.84$, $p=.0001$). Paired t-tests showed pre post changes on four of the seven measures, including attitude toward the poor, social justice, human nature, and individual causes of poverty. The direction of the scales suggests that positive changes occurred in both groups.

Table 7 Student Attitudes toward Course Topic

	Mastery		Non-mastery	
	Pre	Post	Pre	Post
The poor*	122.80[a]	113.20	119.20	111.50
	30.60[b]	32.00	28.92	34.50
Public assistance	54.80	54.50	54.60	55.60
	4.60	5.70	5.70	5.90
Socio-political concerns:				
Social justice*	27.43	24.30	24.80	23.20
	5.00	4.90	6.10	6.40
Human nature*	31.50	34.70	34.50	36.40
	6.60	6.30	6.40	6.20
Poverty:				
Antipathy	44.70	43.20	42.70	41.50
	10.40	10.00	12.40	9.70
Structural causes	30.90	31.20	31.10	30.70
	6.60	6.70	6.90	5.90
Individual causes*	9.80	8.50	9.00	6.20
	7.60	7.60	7.40	6.50

Note. a: Mean scores
b: Standard deviations
*$p<.0001$

Instructional Preference

A chi-square showed a relationship existed between group and student preference for instructional method ($X^2_{(1)}$=52.40, p=.01). The entire mastery group (100%) preferred mastery to non-mastery instruction, while 43% of the non-mastery group preferred mastery instruction based on a description.

Course Evaluations

Both instructors received similar positive ratings on the standard social work department course evaluation form ($t_{(123)}$=-.85, p=.40). The rating scale for the positively phrased questions ranged from 5.0 (strongly agree), to zero (strongly disagree). Both instructors received positive ratings (Mastery: Mean = 4.8 of 5.0, SD = .57; Non-mastery: Mean = 4.7, SD = .71).

Instructor Time Spent

Data collected from the instructor created calendars were examined for descriptive purposes only for an idea of how much time both instructors spent outside class time with students. The non-mastery instructor spent 14.25 hours outside class time over the semester and recorded 14 student contacts during office hours. The mastery instructor spent 21 hours outside class time and recorded 79 student contacts in both outside class correctives and make-up exams. The mastery instructor spent 6.75 more hours per semester with students outside class time but saw 65 more students compared to the non-mastery instructor.

Supplementary Results

Grades are reported for descriptive purposes only, using a mean score of the three exams. Exam scores were converted to letter grades with standard numerical

cutoffs (A = 90-100%, B = 80-89%, etc.). Achievement in the mastery group reflected substitution of make-up exam scores for original exam scores (Table 8).

Table 8 Final Grade Distribution using Letter Grades

	Mastery group		Non-mastery group	
Letter grade	n	%	n	%
A (90-100%)	20	29%	17	25%
B (80-89%)	36	53%	26	38%
C (70-79%)	12	18%	17	25%
D (60-69%)	0	0	6	9%
F (50-59%)	0	0	2	3%

Letter grades of A or B were earned by 82% of the mastery group, and 63% of the non-mastery group. The whole mastery group (100%), and 88% of the non-mastery group earned a grade of C or better. Although both groups had similar mean exam scores, the mastery group had a greater percent of A, B, and C grades and no D or F grades.

DISCUSSION

Was mastery learning effective in a BSW level social work course? Yes. Mastery learning generated results that were at least similar, and in no instance worse, than non-mastery instruction on several measures of achievement and attitude toward course topic. Mastery learning involved reasonable amounts of instructor time spent, and students overwhelmingly preferred mastery learning.

Clearly, the make-up exams resulted in the mastery group outscoring the non-mastery group. The average make-up exam score gain of 12.67 points suggests that achievement can improve during the confines of a semester and that increased learning

does depend on increased time allowed and increased learning error correction (Bloom, 1968; Carroll, 1963). Make-up exams also may have increased student motivation to achieve since 62% of make-up exams were taken voluntarily by students who had already scored at least 70% on the exams. The gains also suggest, quite rightly, that mastery learning is more effective with retesting cycles. Retesting cycles are an essential feature of mastery learning and are predicted to result in achievement gains, if learning errors are corrected (Bloom, Hastings & Madaus, 1971; Decker, 1976; Fehlen, 1976; Omelich & Covington, 1981). Without correctives, students could take a make-up exam and simply repeat the mistakes they made on the exam. As evidence of uncorrected learning errors, this instructor noted that with the quizzes, the mastery group asked few clarification questions before but many questions afterward. Social work educators will find that using quizzes and correctives helps in detecting and remedying student learning errors.

Social work educators who utilize additional rounds of make-up exams or more correction of learning errors may obtain even greater achievement gains than found in this study. Greater achievement implies better preparation for future social work courses, especially in multi-part courses where early learning supports later learning. Both the mastery and non-mastery learning groups made similar positive changes in attitudes toward the host course topic of poverty suggesting that social work educators who use mastery learning will not sacrifice student attitude change for achievement, or the reverse.

The time required to set up mastery learning was not measured but the mastery instructor noted it as a negative because it was impossible to predict how much time

would be needed. However, the time required for this implementation of mastery learning was not felt to be prohibitive and no time was spent on implementation once materials were prepared. Mastery instruction required about seven more hours of instructor time than non-mastery instruction but instructor time required may be related to how the mastery elements are structured. For example, correcting students individually is more time intensive than correcting students together as a group (Arlin, 1984; Fitzpatrick, 1985; Lewis, 1984; Palardy, 1986; Slavin, 1987). Social work educators may find ways to decrease the time spent during the semester. For example, students could take make-up exams outside class together from different courses, thus reducing the time spent proctoring make-up exams. Similarly, review sessions for different courses could be held together or students could lead the correctives and help correct each other.

The 100% student preference for mastery learning suggests students experienced mastery learning positively. Course evaluations showed students rated both instructors similarly although the non-mastery instructor was more experienced than the mastery instructor. Both students and the mastery instructor were clear about learning expectations and essential course content throughout the course. This is no small advantage for novice instructors or those preparing new materials for the first time. Social work instructors also may obtain greater achievement results as their experience with mastery learning increases.

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